

WHAT IS CLAIMED IS:

1        1. A composition for the preparation of microcups used in a liquid crystal  
2 display which composition comprises a thermoplastics, a thermoset or a precursor  
3 thereof and liquid crystals.

1        2. The composition of Claim 1 which is an embossable composition.

1        3. The composition of Claim 1 wherein the liquid crystal has a  
2 concentration no greater than its solubility limit in the microcup composition.

1        4. The composition of Claim 1 wherein said thermoplastic, thermoset or  
2 precursor thereof is a multifunctional acrylate or methacrylate, vinyl ether, epoxide  
3 and an oligomer or polymer thereof.

1        5. A composition for the preparation of microcups used in a liquid crystal  
2 display which composition comprises a thermoplastics, a thermoset or a precursor  
3 thereof and a speed enhancing comonomer or oligomer.

1        6. The composition of Claim 5 which is an embossable composition.

1        7. The composition of Claim 5 wherein said speed enhancing  
2 comonomer or oligomer comprises a poly(ethylene glycol) or poly(propylene glycol)  
3 moiety.

1        8. The composition of Claim 7 wherein said poly(ethylene glycol) or  
2 poly(propylene glycol) moiety is poly(ethylene glycol) monoacrylate, poly(ethylene  
3 glycol) monomethacrylate, poly(ethylene glycol) diacrylate, poly(ethylene glycol)  
4 dimethacrylate, poly(propylene glycol) monoacrylate, poly(propylene glycol)  
5 monomethacrylate, poly(propylene glycol) diacrylate or poly(propylene glycol)  
6 dimethacrylate.

1       9.     The composition of Claim 5 wherein said thermoplastic, thermoset or  
2 precursor thereof is a multifunctional acrylate or methacrylate, vinyl ether, epoxide  
3 and an oligomer or polymer thereof.

1       10.    A liquid crystal display comprising two or more layers of microcup  
2 array wherein said microcups are formed from a composition comprising a  
3 thermoplastics, a thermoset or a precursor thereof and liquid crystals.

1       11.    The liquid crystal display of Claim 10 wherein the liquid crystal has a  
2 concentration no greater than its solubility limit in the microcup composition.

1       12.    The liquid crystal display of Claim 10 wherein said thermoplastic,  
2 thermoset or precursor thereof is a multifunctional acrylate or methacrylate, vinyl  
3 ether, epoxide and an oligomer or polymer thereof.

1       13.    The liquid crystal display of Claim 10 wherein said two or more layers  
2 of microcup array are arranged in a staggered manner.

1       14.    A liquid crystal display comprising two or more layers of microcup  
2 array wherein said microcups are formed from a composition comprising a  
3 thermoplastics, a thermoset or a precursor thereof and a speed enhancing  
4 comonomer or oligomer.

1       15.    The liquid crystal display of Claim 14 wherein said speed enhancing  
2 comonomer or oligomer comprises a poly(ethylene glycol) or poly(propylene glycol)  
3 moiety.

1       16.    The liquid crystal display of Claim 15 wherein said poly(ethylene  
2 glycol) or poly(propylene glycol) moiety is poly(ethylene glycol) monoacrylate,  
3 poly(ethylene glycol) monomethacrylate, poly(ethylene glycol) diacrylate,  
4 poly(ethylene glycol) dimethacrylate, poly(propylene glycol) monoacrylate,

5 poly(propylene glycol) monomethacrylate, poly(propylene glycol) diacrylate or  
6 poly(propylene glycol) dimethacrylate.

1       17. The liquid crystal display of Claim 14 wherein said thermoplastic,  
2 thermoset or precursor thereof is a multifunctional acrylate or methacrylate, vinyl  
3 ether, epoxide and an oligomer or polymer thereof.

1       18. The liquid crystal display of Claim 14 wherein said two or more layers  
2 of microcup array are arranged in a staggered manner.

1       19. A process for the manufacture of a liquid crystal display of more than  
2 one layer of microcup array, which process comprises:

3           a) preparing separately two layers of microcup array, each on a  
4 conductor film; and

5           b) laminating one of the layers over the other optionally with an  
6 adhesive layer.

1       20. The process of Claim 19 wherein said microcups are prepared from a  
2 composition comprising a thermoplastics, a thermoset or a precursor thereof and  
3 liquid crystals.

1       21. The process of Claim 19 wherein said microcups are prepared from a  
2 composition comprising a thermoplastics, a thermoset or a precursor thereof and a  
3 speed enhancing comonomer or oligomer.

1       22. The process of Claim 20 wherein step (a) is carried out by forming  
2 microcups over a conductor film, filling said microcups with a liquid crystal  
3 composition optionally comprising a guest dye and sealing the filled microcups with  
4 a polymeric sealing layer.

1       23. The process of Claim 21 wherein step (a) is carried out by forming  
2 microcups over a conductor film, filling said microcups with a liquid crystal

3 composition optionally comprising a guest dye and sealing the filled microcups with  
4 a polymeric sealing layer.

1 24. The process of Claim 20 wherein step (b) is carried out by laminating  
2 one layer of the microcups over the other layer with the sealing sides of the two  
3 layers facing each other.

1 25. The process of Claim 21 wherein step (b) is carried out by laminating  
2 one layer of the microcups over the other layer with the sealing sides of the two  
3 layers facing each other.

1 26. The process of Claim 20 wherein one or both layers of microcup  
2 array is a full-color array prepared by a process comprising (i) laminating or coating  
3 said microcup array with a positively working photoresist, (ii) imagewise exposing  
4 and developing the positive photoresist to open microcups in a predetermined  
5 area, (iii) filling the opened microcups with a liquid crystal composition optionally  
6 containing guest dye(s) of a first primary color, (iv) sealing the filled microcups and  
7 (v) repeating the steps (ii)-(iv).

1 27. The process of Claim 21 wherein one or both layers of microcup  
2 array is a full-color array prepared by a process comprising (i) laminating or coating  
3 said microcup array with a positively working photoresist, (ii) imagewise exposing  
4 and developing the positive photoresist to open microcups in a predetermined  
5 area, (iii) filling the opened microcups with a liquid crystal composition optionally  
6 containing guest dye(s) of a first primary color, (iv) sealing the filled microcups and  
7 (v) repeating the steps (ii)-(iv).

1 28. A process for the preparation of a liquid crystal display of more than  
2 one layer of microcup array, which process comprises:

3 a) forming a first layer of microcups on a conductor film;  
4 b) forming a second layer of microcups on a transfer release substrate;

5           c)     laminating said second layer over said first layer and removing said  
6 transfer release substrate;  
7           d)     optionally forming separately additional layers of microcups on  
8 transfer release substrates;  
9           e)     laminating said additional layers over the top layer in a stack of layers  
10 already formed and removing the transfer release substrates; and  
11          f)     laminating a second conductor film over the top most layer of said  
12 stack.

1           29.   The process of Claim 28 wherein said microcups are prepared from a  
2 composition comprising a thermoplastics, a thermoset or a precursor thereof and  
3 liquid crystals.

1           30.   The process of Claim 28 wherein said microcups are prepared from a  
2 composition comprising a thermoplastics, a thermoset or a precursor thereof and a  
3 speed enhancing comonomer or oligomer.

1           31.   The process of Claim 29 wherein step (a) is carried out by forming  
2 microcups on a conductor film, filling said microcups with a liquid crystal  
3 composition optionally comprising a guest dye and sealing the filled microcups with  
4 a polymeric sealing layer.

1           32.   The process of Claim 30 wherein step (a) is carried out by forming  
2 microcups on a conductor film, filling said microcups with a liquid crystal  
3 composition optionally comprising a guest dye and sealing the filled microcups with  
4 a polymeric sealing layer.

1           33.   The process of Claim 29 wherein steps (b) and (d) are carried out by  
2 forming microcups on said transfer release layer, filling said microcups with a liquid  
3 crystal composition optionally comprising a guest dye and sealing the filled  
4 microcups with a polymeric sealing layer.

1       34. The process of Claim 30 wherein steps (b) and (d) are carried out by  
2 forming microcups on said transfer release layer, filling said microcups with a liquid  
3 crystal composition optionally comprising a guest dye and sealing the filled  
4 microcups with a polymeric sealing layer.

1       35. The process of Claim 29 wherein step (c) is carried out by laminating  
2 said second layer over said first layer with the sealing sides of the two layers facing  
3 each other, followed by removing said transfer release substrate.

1       36. The process of Claim 30 wherein step (c) is carried out by laminating  
2 said second layer over said first layer with the sealing sides of the two layers facing  
3 each other, followed by removing said transfer release substrate.

1       37. The process of Claim 29 wherein step (e) is carried out by laminating  
2 said additional layers over the top layer in said stack of layers already formed, with  
3 the sealing sides of the additional layers facing the layers underneath, followed by  
4 removing said transfer release substrates.

1       38. The process of Claim 30 wherein step (e) is carried out by laminating  
2 said additional layers over the top layer in said stack of layers already formed, with  
3 the sealing sides of the additional layers facing the layers underneath, followed by  
4 removing said transfer release substrates.

1       39. The process of Claim 29 wherein step (f) is carried out by lamination  
2 with or without an adhesive layer.

1       40. The process of Claim 30 wherein step (f) is carried out by lamination  
2 with or without an adhesive layer.

1       41. The process of Claim 29 wherein said microcup array in step (a), (b),  
2 (d) or a combination thereof is a full-color array prepared by a process comprising  
3 (i) laminating or coating said microcup array with a positively working photoresist,

4       (ii) imagewise exposing and developing the positive photoresist to open microcups  
5       in a predetermined area, (iii) filling the opened microcups with a liquid crystal  
6       composition optionally containing guest dye(s) of a first primary color, (iv) sealing  
7       the filled microcups and (v) repeating the steps (ii)-(iv).

1           42. The process of Claim 30 wherein said microcup array in step (a), (b),  
2       (d) or a combination thereof is a full-color array prepared by a process comprising  
3       (i) laminating or coating said microcup array with a positively working photoresist,  
4       (ii) imagewise exposing and developing the positive photoresist to open microcups  
5       in a predetermined area, (iii) filling the opened microcups with a liquid crystal  
6       composition optionally containing guest dye(s) of a first primary color, (iv) sealing  
7       the filled microcups and (v) repeating the steps (ii)-(iv).

1           43. A process for the manufacture of a liquid crystal display of more than  
2       one layer of microcup array, which process comprises:

3           a) preparing a first layer of microcup array on a first conductor film;  
4           b) preparing a second layer of microcup array on top of the first layer;  
5           c) optionally preparing additional layers of microcup array on top of a  
6       stack of layers already formed; and  
7           d) laminating a second conductor film on top of the top most layer of  
8       microcup array, optionally with an adhesive layer.

1           44. The process of Claim 43 wherein said microcups are prepared from a  
2       composition comprising a thermoplastics, a thermoset or a precursor thereof and  
3       liquid crystals.

1           45. The process of Claim 43 wherein said microcups are prepared from a  
2       composition comprising a thermoplastics, a thermoset or a precursor thereof and a  
3       speed enhancing comonomer or oligomer.

1           46. The process of Claim 44 wherein steps (a), (b) and (c) are carried out  
2       by forming microcups over a conductor film, filling said microcups with a liquid

3        crystal composition optionally comprising a guest dye and sealing the filled  
4        microcups with a polymeric sealing layer.

1            47.      The process of Claim 45 wherein steps (a), (b) and (c) are carried out  
2        by forming microcups over a conductor film, filling said microcups with a liquid  
3        crystal composition optionally comprising a guest dye and sealing the filled  
4        microcups with a polymeric sealing layer.

1            48.      The process of Claim 44 wherein said microcup array in step (a), (b),  
2        (c) or a combination thereof is a full-color array prepared by a process comprising  
3        (i) laminating or coating said microcup array with a positively working photoresist,  
4        (ii) imagewise exposing and developing the positive photoresist to open microcups  
5        in a predetermined area, (iii) filling the opened microcups with a liquid crystal  
6        composition optionally containing guest dye(s) of the a primary color, (iv) sealing  
7        the filled microcups and (v) repeating the steps (ii)-(iv).

1            49.      The process of Claim 45 wherein said microcup array in step (a), (b),  
2        (c) or a combination thereof is a full-color array prepared by a process comprising  
3        (i) laminating or coating said microcup array with a positively working photoresist,  
4        (ii) imagewise exposing and developing the positive photoresist to open microcups  
5        in a predetermined area, (iii) filling the opened microcups with a liquid crystal  
6        composition optionally containing guest dye(s) of the a primary color, (iv) sealing  
7        the filled microcups and (v) repeating the steps (ii)-(iv).